UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/779,440	02/09/2001	Kentaro Shiomi	60188-031	6677

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EXAMINER
KIM, JUNG W

ART UNIT	PAPER NUMBER
2132	

DATE MAILED: 06/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	**Applicant(s)**
Office Action Summary	09/779,440	SHIOMI ET AL.
	Examiner	**Art Unit**	
	Jung Kim	2132	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on _28 April 2006_.

2a) ☒ This action is **FINAL.**   2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle,* 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) _1-7,24 and 25_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☒ Claim(s) _2-7_ is/are allowed.

6) ☒ Claim(s) _1,24 and 25_ is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☒ All b) ☐ Some * c) ☐ None of:

      1. ☒ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

1.   This Office action is in response to the amendment filed on 4/28/06.

2.   Claims 1-7, 24 and 25 are pending.

3.   Claims 8-23 are canceled.

4.   Claims 1, 24 and 25 are amended.

Response to Arguments

5.   The 112, 2nd paragraph rejections to claims 1, 24 and 25 as omitting essential

structural cooperative relationships of elements and essential elements are withdrawn in

view of applicant's arguments. In particular, applicant's arguments that "[t]he particular

mechanism by which conversion of the circuit design data into encrypted design data is

effected and the value of the key data are not essential for operation of the invention in

its entire, broad scope ... [t]he claims need not recite the particular manner by which the

key data corresponds to the encrypted circuit design data to effect the "unlocking"

thereof..." are persuasive.

6.   Applicant's arguments on pgs. 9-10, with respect to the prior art rejections of

claims 1, 24 and 25 have been fully considered but are not persuasive. Specifically,

Applicant's argue that the prior art does not teach the step of "the circuit design data is

selected to operate as targeted when the (real) key data is inputted into the LSI after the

step of converting the circuit design data into encrypted circuit design data." Examiner

disagrees with applicant's contention. On section 4.2 "Insert Dead or Irrelevant Code",

Collberg discloses using a predicate to select between two obfuscated code segments

at runtime; these code segments are generated using different obfuscation techniques

on the original code segment. As articulated in the "Response to Arguments" section of

the previous Office action, mailed on 11/28/05, the predicate operates as a selection

signal and is consistent within the meaning of a key value as disclosed in applicant's

Specification and claims. This interpretation of the new limitation in view of the prior art

is consistent with applicant's own admission of the essential nature of the claimed

invention. (supra) Therefore, since the selection of the predicate is determined at

runtime and the selection at runtime enables the encrypted circuit design to run as

targeted, the prior art of record discloses the new limitation.

7.   In reply to applicant's argument that Collberg teaches away from accessing the

alleged dummy data (pg. 10, 1st full paragraph), examiner disagrees and directs

applicant's attention to fig. 4(b), wherein at runtime, either of one of two paths are

selected.

8.   Finally, in reply to applicant's argument that Collberg is completely silent as to

the alleged dummy design data having the same number of inputs/outputs as the real

circuit, examiner respectfully disagrees for two reasons. First, circuit design principles

conventionally require groups of bits, which are fixed in size, to be transferred between

circuit modules (16, 32 or 64 bit words are standards). Dummy circuits combined with

"real" circuits would obey the standards of the circuit design and incorporate fixed data

inputs and outputs corresponding to the number of bits comprising a word to be

transferred to maintain the stealth of the obfuscation transformation (Collberg, section

3.2.2; a dummy circuit having a number of data inputs and/or outputs different from the conventional word size is conspicuously distinct from the other circuits). Second, the branch instruction between two flow paths as identified in figure 4(b) of Collberg shows two parallel code segments (S^a and S^b) wherein both obfuscated code segments take in equivalent inputs and outputs identical values. Moreover, since Johnson discloses that hardware design and high-level programming languages are generally encoded based on similar principles (Johnson, col. 7:67-8:48), this disclosure of Collberg suggests having the same number of inputs/outputs as the real circuit. Hence, the amended claims remain rejected as being unpatentable over the prior art of record.

Claim Rejections - 35 USC § 112

9.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10.   Claims 1, 24 and 25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

11.   Claims 1, 24 and 25 define the limitation "wherein the circuit design data is selected to operate as targeted when the key data is inputted into the LSI after the step of converting the circuit design data into encrypted circuit design data." However, the limitation is indefinite because the language of the claim suggests selecting to operate the circuit design data using the generated key data when the key data is inputted into the LSI **after the step of converting** the circuit design data into encrypted circuit

design data. On the face of the limitation, this is not feasible because the circuit design

data is converted into encrypted circuit design data at the time of selection.

Claim Rejections - 35 USC § 103

12.   Claims 1, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Johnson et al. USPN 6,088,452 (hereinafter Johnson) in view of Collberg et al.

"Manufacturing Cheap, Resilient, and Stealthy Opaque Constructs" (hereinafter

Collberg).

13.   As per claim 1, Johnson discloses a method for designing a circuit, comprising

the step of encrypting provided circuit design data (Johnson, Abstract), the encrypting

step includes the steps of:

> a.   generating dummy circuit design data; converting the circuit design data
>
> into encrypted circuit design data by combining the circuit design data and the
>
> dummy circuit design data (Johnson, col. 12:9-20).

14.   Johnson does not expressly disclose generating key data, wherein the circuit

design data is selected to operate as targeted when the key data is inputted into the LSI

after the step of converting the circuit design data into encrypted circuit design data.

Collberg discloses multiple opaque constructs wherein irrelevant code is inserted into

an original code by means of a branch insertion transformation (Collberg, fig. 4(b)); a

basic block is replaced with two different obfuscated versions by applying different sets

of obfuscating transformations to the basic block. At runtime, a predicate selects one of

two paths, the operation of the code being equivalent regardless of the selection of the paths. (Collberg, section 4.2, 3rd paragraph) This runtime value is the key data of the obfuscation technique disclosed by Collberg. Moreover, although Collberg discloses such limitations in the context of software design rather than hardware design, the two areas are closely linked: Johnson discloses that hardware design and high-level programming languages are generally encoded based on similar principles (Johnson, col. 7:67-8:48). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made for the encryption step of Johnson to generate key data, wherein the circuit design data is selected to operate as targeted when the key data is inputted into the LSI after the step of converting the circuit design data into encrypted circuit design data, since the insertion of dummy data by a branch insertion transformation instills more complexity and hence better obfuscation of program design. Collberg, section 4.2, 1st paragraph. The aforementioned cover the limitations of claim 1.

15.   As per claim 24, Johnson discloses a method for designing a circuit, comprising the step of encrypting provided circuit design data (Johnson, Abstract), the encrypting step includes the steps of:

    b.   generating dummy circuit design data; converting the circuit design data into encrypted circuit design data by combining the circuit design data and the dummy circuit design data (Johnson, col. 12:9-20).

16.   Johnson does not expressly disclose generating real key data and dummy key

data, wherein the circuit design data is selected to operate as targeted with the real key

data and the dummy circuit design data is selected to operate with the dummy key data,

wherein the circuit design data is selected to operate as targeted when the key data is

inputted into the LSI after the step of converting the circuit design data into encrypted

circuit design data. Collberg discloses multiple opaque constructs wherein irrelevant

code is inserted into an original code by means of a branch insertion transformation

(Collberg, fig. 4(b)); a basic block is replaced with two different obfuscated versions by

applying different sets of obfuscating transformations to the basic block. At runtime, a

predicate selects one of two paths, the operation of the code being equivalent

regardless of the selection of the paths. (Collberg, section 4.2, 3rd paragraph) This

runtime value is the key data of the obfuscation technique disclosed by Collberg. This

disclosure of Collberg suggests that the feature of inputting real key data and dummy

key data after the step of converting the circuit design data into encrypted circuit design

data are obvious implementations in the field of obfuscation of program design.

Moreover, although Collberg discloses such limitations in the context of software design

rather than hardware design, the two areas are closely linked: Johnson discloses that

hardware design and high-level programming languages are generally encoded based

on similar principles (Johnson, col. 7:67-8:48). Therefore, it would be obvious to one of

ordinary skill in the art at the time the invention was made for the encryption step of

Johnson to generate a real key data and dummy key data, wherein the circuit design

data is selected to operate as targeted with the real key data and the dummy circuit

design data is selected to operate with the dummy key data, wherein the circuit design

data is selected to operate as targeted when the key data is inputted into the LSI after

the step of converting the circuit design data into encrypted circuit design data, since

conditional transformations that insert additional predicates within a program instills

more complexity and hence better obfuscation of program design. Collberg, section

4.3, 1st paragraph. The aforementioned cover the limitations of claim 24.

17.   As per claim 25, Johnson discloses a method for designing a circuit, comprising

the step of encrypting provided circuit design data (Johnson, Abstract), the encrypting

step includes the steps of:

> c.   generating dummy circuit design data having a same number of inputs
>
> and a same number of outputs as those of the circuit design data; converting the
>
> circuit design data into encrypted circuit design data by combining the circuit
>
> design data and the dummy circuit design data (Johnson, col. 12:9-20,
>
> especially, lines 11-14).

18.   Johnson does not expressly disclose generating key data, wherein the circuit

design data is selected to operate as targeted when the key data is inputted into the LSI

after the step of converting the circuit design data into encrypted circuit design data.

Collberg discloses multiple opaque constructs wherein irrelevant code is inserted into

an original code by means of a branch insertion transformation (Collberg, fig. 4(b)); a

basic block is replaced with two different obfuscated versions by applying different sets

of obfuscating transformations to the basic block. At runtime, a predicate selects one of

two paths, the operation of the code being equivalent regardless of the selection of the

paths. (Collberg, section 4.2, 3rd paragraph) This runtime value is the key data of the

obfuscation technique disclosed by Collberg. Moreover, although Collberg discloses

such limitations in the context of software design rather than hardware design, the two

areas are closely linked: Johnson discloses that hardware design and high-level

programming languages are generally encoded based on similar principles (Johnson,

col. 7:67-8:48). Therefore, it would be obvious to one of ordinary skill in the art at the

time the invention was made for the encryption step of Johnson to generate key data,

wherein the circuit design data is selected to operate as targeted when the key data is

inputted into the LSI after the step of converting the circuit design data into encrypted

circuit design data, since the insertion of dummy data by a branch insertion

transformation instills more complexity and hence better obfuscation of program design.

Collberg, section 4.2, 1st paragraph. The aforementioned cover the limitations of claim

25.

Allowable Subject Matter

19.   Claims 2-7 are allowed.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time

policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the mailing date of this final action.

Communications Inquiry

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Jung W. Kim whose telephone number is 571-272-3804.

The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Gilberto Barron can be reached on 571-272-3799. The fax phone number

for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

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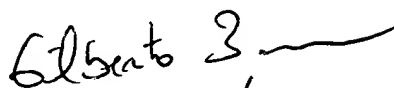
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Jung W Kim
Examiner
Art Unit 2132

GILBERTO BARRON JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100

June 9, 2006